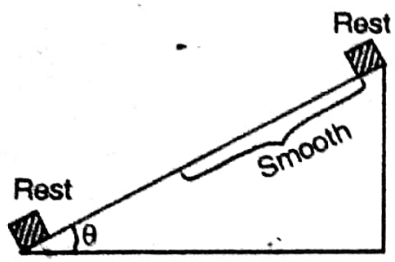
Time : 3 Hrs. **TEST - 3** MM : 720

[PHYSICS]

Choose the correct answer :

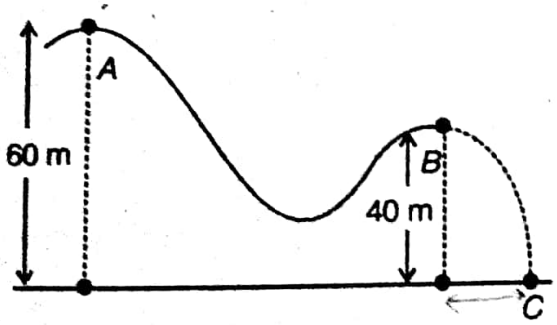
1. A block starts from rest from top of incline plane whose last $\frac{1}{3}$rd part is rough. If block comes to rest at bottom, then value of coefficient of friction between block and incline plane is



(1) $\mu = \frac{1}{2}\tan\theta$ (2) $\mu = 3\tan\theta$

(3) $\mu = \tan\theta$ (4) $\mu = \frac{1}{3}\tan\theta$

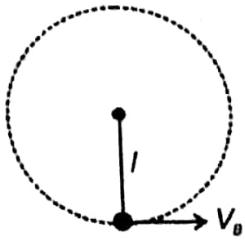
2. A body is released from rest at a point *A*. The separation (horizontal) between points *B* and *C*, is



(1) $40\sqrt{2}$ m (2) 20 m

(3) 40 m (4) $\frac{40}{\sqrt{2}}$ m

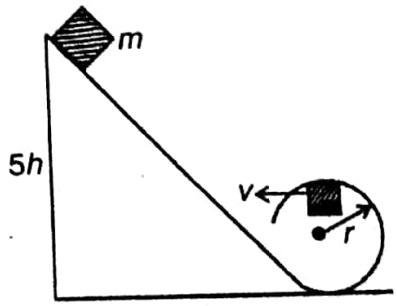
3. A bob of mass *m* is attached with a light massless stick at one end. Other end of stick is fixed such that it is free to move in vertical plane as shown. The minimum speed given at bottom is V_B so that it just completes circular motion. The value of V_B is



(1) $\sqrt{3gl}$ (2) $\sqrt{2gl}$

(3) $\sqrt{5gl}$ (4) $\sqrt{4gl}$

4. A block of mass *m* is released from rest on smooth track at height 5*h*. The speed of the block at point shown on the circular track of radius *r* is

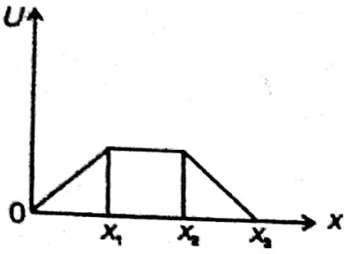


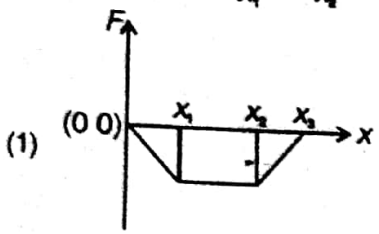
(1) $\sqrt{g(5h-2r)}$ (2) $\sqrt{2g(5h-2r)}$

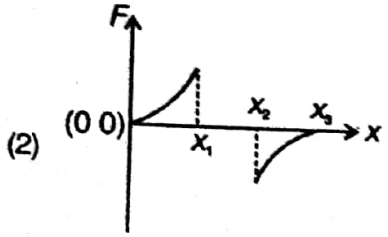
(3) $\sqrt{g(5h-r)}$ (4) $\sqrt{2g(5h-r)}$

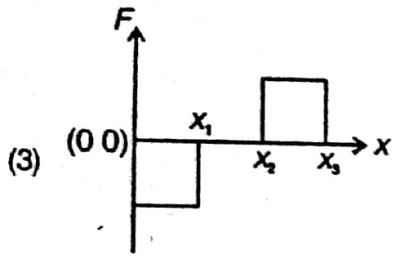
Space for Rough Work

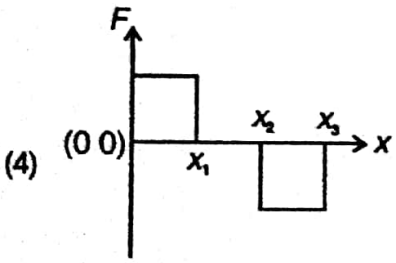
5. Potential energy U of a body varies with position x as shown in figure. The force F acting on the body varies with position as



(1) 

(2) 

(3) 

(4) 

6. A car is moving on straight line on frictionless surface. If engine is delivering constant power, then displacement x of car varies with time t as

(1) $x \propto t^{2/3}$ (2) $x \propto t^{3/2}$

(3) $x \propto t$ (4) $x \propto t^{1/2}$

7. A particle of mass m is moving on a straight line such that its speed changes with distance travelled as $v = \beta\sqrt{x}$. The work done by net force on the particle during first t second is

(1) $\frac{m\beta^4 t^2}{8}$ (2) $\frac{m\beta^2 t}{4}$

(3) $\frac{m\beta^2 t^2}{4}$ (4) $\frac{m\beta^4 t}{8}$

8. A projectile of mass 2 kg is projected with speed 20 m/s at an angle 60° from horizontal. The work done by gravity on it during the time it reaches its highest point, is

(1) 300 J (2) –300 J

(3) 173.2 J (4) –173.2 J

9. Change in kinetic energy of a particle is equal to work done on it

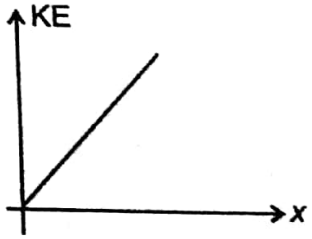
(1) If force is conservative

(2) If force is non-conservative

(3) In inertial as well as non-inertial reference frame

(4) All of these

10. A particle is acted upon by some force so that its kinetic energy varies with position x as shown in the figure. Select correct statement.



(1) Acceleration of particle remains constant with time

(2) Force on particle decreases with time

(3) Acceleration of particle varies linearly with time

(4) Acceleration of particle varies parabolically with time

Space for Rough Work

11. A uniform rope of mass m and length l is kept on a smooth surface table so that its $\frac{1}{4}$th length is hanging. The minimum work done to pull the rope back on the table is

(1) $\frac{mgl}{9}$ (2) $\frac{mgl}{32}$

(3) $\frac{mgl}{6}$ (4) $\frac{mgl}{18}$

12. Momentum of a particle is increased by 60%. The percentage increase in its kinetic energy is

(1) 140% (2) 156%

(3) 120% (4) 30%

13. The potential energy function for a conservative force is given by $U = \beta(2x + 4y)$. The work done by the conservative force in displacing a particle from point $P(1, 2)$ to $Q(3, 5)$ is equal to

(1) -16β (2) $+10\beta$

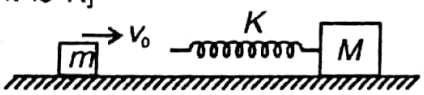
(3) -10β (4) -26β

14. Power given to a particle varies with time as $P = (3t^2 + 2t + 6)$ watt. The change in KE of the particle in first 3 second of its motion is (assume that particle is moving on horizontal smooth surface)

(1) 49 J (2) 54 J

(3) 27 J (4) 36 J

15. A block of mass m moving with velocity v_0 collides with another stationary block of mass M as shown. The maximum compression in the spring is [Assume all surfaces to be smooth and spring constant is K]



(1) $\sqrt{\frac{2mM}{K(M+m)}} \times v_0$ (2) $\sqrt{\frac{\sqrt{2}mM}{K(M+m)}} \times v_0$

(3) $\sqrt{\frac{mM}{2K(M+m)}} \times v_0$ (4) $\sqrt{\frac{mM}{K(M+m)}} \times v_0$

16. A ball of mass 1 kg is moving in vertical circle of radius 1 m with the help of an ideal string. If ratio of maximum and minimum tension in the string is 7 then the value of maximum and minimum tensions, are (g = 10 m/s^2)

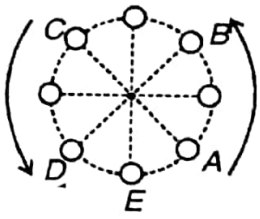
(1) T_{max} = 280 N, T_{min} = 40 N

(2) T_{max} = 70 N, T_{min} = 10 N

(3) T_{max} = 140 N, T_{min} = 20 N

(4) T_{max} = 210 N, T_{min} = 30 N

17. A ball connected with an ideal string is moving in vertical circle and just completing the circular motion as shown in the figure. The tangential acceleration of ball is zero when ball is at position



(1) D

(2) E

(3) A

(4) B

18. Assume that average work done by human heart while it beats once is 0.8 J. If normal heart beats 80 times in one minute at normal temperature and it beats 90 times in one minute when body temperature is 100° F, then what extra power heart has to pump in per minute when body temperature is 100° F?

(1) 0.13 W

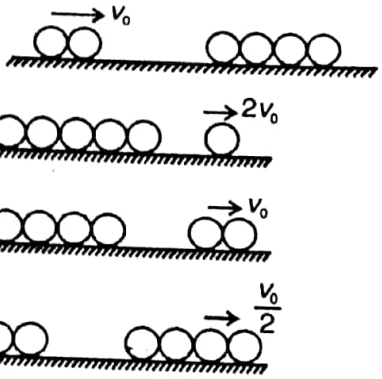
(2) 1.6 W

(3) 0.82 W

(4) 0.04 W

Space for Rough Work

19. Four identical ball bearings in contact with each other and resting on a frictionless surface are hit head-on by other two identical ball bearings as shown. Then the possible outcome(s) may be



(1) Only (I) (2) Only (II)
(3) Only (III) (4) All of these

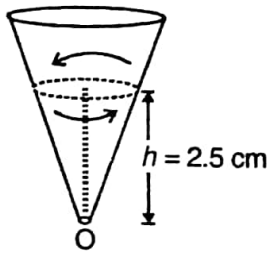
20. Select incorrect statement regarding mechanical energy of a body/system.
(1) It is sum of kinetic and potential energy
(2) It may be conserved even if non-conservative force acts on the body/system
(3) Work done by conservative force is always equal to negative of change in mechanical energy
(4) Both (1) & (2)

21. A body of mass 1 kg travels in a straight line with velocity $v = \beta x^{3/2}$ where $\beta = 5 m^{-1/2} s^{-1}$. The work done by the net force during displacement from $x = 0$ to $x = 3m$ is
(1) 337.5 J (2) 427.5 J
(3) 437.5 J (4) 238.4 J

22. When conservative force does positive work on a system then potential energy of system
(1) Remains same
(2) First increases then decreases
(3) Increases
(4) Decreases

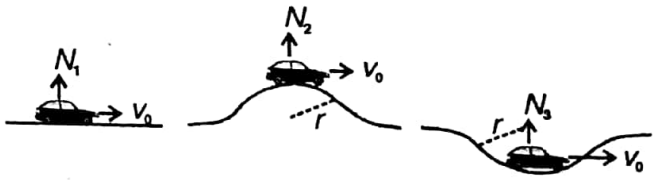
23. A trolley is sliding on smooth fixed wedge of inclination 60° with horizontal. A pendulum is connected with the ceiling of trolley whose thread makes angle θ with vertical then θ is equal to
(1) 45° (2) 0°
(3) 60° (4) 30°

24. A particle is describing horizontal circular motion in a conical funnel. If height of centre of circle on which particle is moving is 2.5 cm from the vertex of cone then the speed of the particle is ($g = 10 m/s^2$)



(1) 0.75 m/s
(2) 1.00 m/s
(3) 0.25 m/s
(4) 0.50 m/s

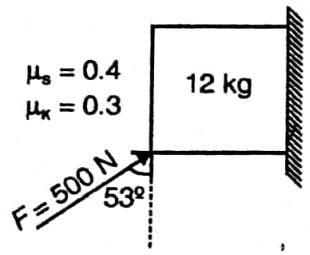
25. Three identical cars are moving with same speed on three different path as shown in figure. Then



(1) $N_2 < N_1 < N_3$
(2) $N_1 = N_2 = N_3$
(3) $N_1 < N_2 < N_3$
(4) $N_2 < N_3 < N_1$

Space for Rough Work

26. The value of acceleration and friction force in the given diagram is

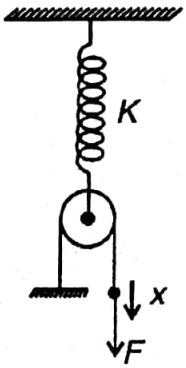


(1) 5 m/s² upward, 36 N
(2) 5 m/s² upward, 120 N
(3) 4 m/s² upward, 120 N
(4) 4 m/s² downward, 120 N

27. Select incorrect statement regarding friction
(1) Static friction is self adjusting in nature
(2) Maximum value of static friction is limiting friction
(3) Kinetic friction must be lesser than static friction
(4) Both (1) & (2)

28. A rocket of initial mass 3.5×10^3 kg, is fired so that its initial net upward acceleration is 10 m/s². The rate of burning of fuel is (velocity of exhaust is 1000 m/s)
(1) 105 kg/s (2) 140 kg/s
(3) 35 kg/s (4) 70 kg/s

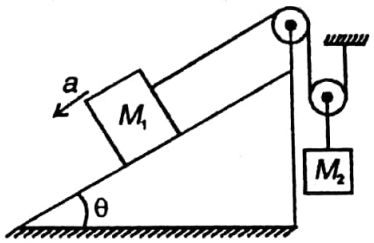
29. When a force F is applied, point of application of force displaces downward by x. If spring constant is K then the value of F is



(1) $F = \frac{K}{2}x$
(2) $F = \frac{K}{4}x$
(3) $F = Kx$
(4) $F = 2Kx$

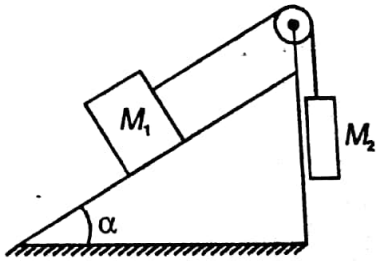
30. A body of mass 2 kg falls from a height h = 30 m on the ground. What is average force experienced by it during its fall? (g = 10 m/s²)
(1) 10 N (2) Zero
(3) 20 N (4) 15 N

31. If acceleration of block m_1 is a downward then acceleration of block m_2 will be



(1) $\frac{a}{2}$ upward
(2) 2a downward
(3) 2a upward
(4) a upward

32. Select the correct statement with respect to the given situation.



(1) If $M_1\sin\alpha > \mu M_1\cos\alpha + M_2$, block M_1 moves upward
(2) If $M_1\sin\alpha > \mu M_1\cos\alpha + M_2$, block M_1 moves downward
(3) If $M_1\sin\alpha > \mu M_1\cos\alpha - M_2$, block M_1 moves downward
(4) Both (1) & (3)

Space for Rough Work

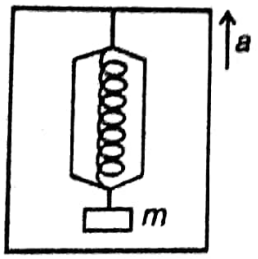
33. A particle of mass 10 kg is acted upon by a force $\vec{F} = (-8\hat{i} + 6\hat{j})$N. If initial velocity of particle is $\vec{u} = (24\hat{i} - 12\hat{j})$ m/s, then time at which particle has velocity just along x axis, is

(1) 20 s (2) 25 s
(3) 7.5 s (4) 15 s

34. A bob of mass 1 kg hung from the ceiling of a room by a string of length 4 m is set into oscillation. The speed of bob, when it is vertically below the hung point (mean position) is 5 m/s and it is 7.2 m above ground at this position. If string is cut when bob is at mean position, then horizontal displacement of bob before hitting the ground is (g = 10 m/s^2)

(1) 6 m (2) $6\sqrt{2}$ m
(3) 4.5 m (4) $5\sqrt{2}$ m

35. A block of mass m is attached to a spring balance whose other end is attached with ceiling of a lift as shown. If lift starts accelerating upward with acceleration a then the reading of spring balance is

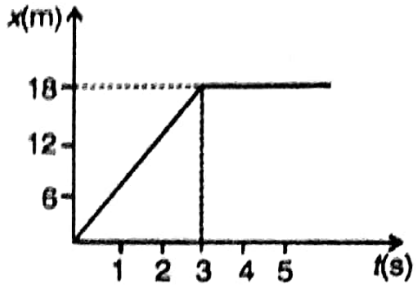


(1) $m\left(1-\frac{a}{g}\right)$N
(2) $m\left(1-\frac{a}{g}\right)$kg wt
(3) $m\left(1+\frac{a}{g}\right)$N
(4) $m\left(1+\frac{a}{g}\right)$kg wt

36. A bullet of mass 200 g is fired with muzzle velocity 100 m/s. If mass of gun is 4 kg then magnitude of the recoil velocity of the gun is

(1) 5.2 m/s (2) 4.1 m/s
(3) 5.0 m/s (4) 4.8 m/s

37. Position time graph of a body of mass 5 kg is given in the diagram. The impulse on body at t = 3 s, is



(1) $6\hat{i}$ kg ms^{-1}
(2) $-6\hat{i}$ kg ms^{-1}
(3) $30\hat{i}$ kg ms^{-1}
(4) $-30\hat{i}$ kg ms^{-1}

38. A plane body is attached with perpendicular axes OX and OY. Following forces are applied on the body

(I) $\vec{F}_1 = 4$ N along the x axis
(II) $\vec{F}_2 = 10$ N along $\overrightarrow{OA}$
(III) $\vec{F}_3 = 15$ N along $\overrightarrow{AB}$

where A = (3a, 4a) and B = ($-$ a, a). The resultant force on the body is

(1) $\vec{F} = -\hat{i} - \hat{j}$
(2) $\vec{F} = -2\hat{i} - \hat{j}$
(3) $\vec{F} = -2\hat{i} - 2\hat{j}$
(4) $\vec{F} = -\hat{i} - 2\hat{j}$

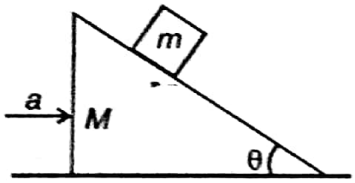
Space for Rough Work

39. A block of mass m is kept in a stationary lift. If lift starts accelerating downward with acceleration of 12 m/s^2. Then displacement of block in 0.5 second of its motion is

(1) 3.75 m (2) 3.50 m

(3) 4.50 m (4) 4.25 m

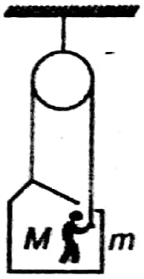
40. A block of mass m is kept on smooth wedge of inclination θ. If wedge is accelerated along horizontal with some acceleration so that block m does not slip over it then the force applied by wedge on the block is



(1) $mg\cos\theta$ (2) $\frac{mg}{\cos\theta}$

(3) $mg\sin\theta$ (4) mg

41. A man of mass M is applying force F on the light rope as shown in the figure. The mass of box in which man is standing is m. If system is in rest then the normal reaction between the box and man is



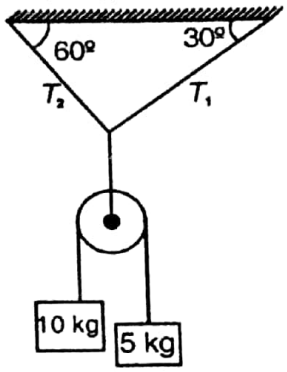
(1) $N = \frac{(M-m)g}{2}$

(2) $N = \frac{(\sqrt{2}M-m)g}{2}$

(3) $N = \frac{(M+m)g}{2}$

(4) $N = (M-m)g$

42. The value of $|T_1 - T_2|$, in the given diagram, is



(1) $\frac{200}{3}(\sqrt{3}-1)$ (2) $200(\sqrt{3}+1)$

(3) $\frac{200}{3}(\sqrt{3}+1)$ (4) $\frac{200}{\sqrt{3}}(\sqrt{3}-1)$

43. Which of the following Newton's law(s) is/are not applicable in non-inertial reference frame?

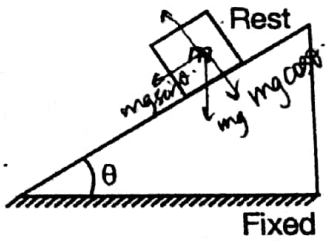
(1) Newton's first law

(2) Newton's second law

(3) Newton's third law

(4) All of these

44. Block of mass m is kept on an incline plane as shown. If block is at rest, the force exerted by the incline plane on the block is



(1) $\frac{mg}{\cos\theta}$ (2) mg

(3) $mg\sin\theta$ (4) $mg\cos\theta$

45. Inertia of a body is measure of

(1) Acceleration of body

(2) Force on the body

(3) Mass of body

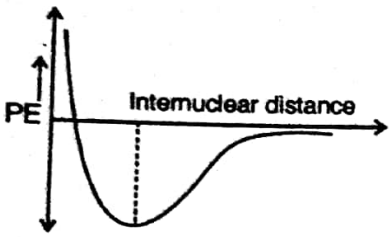
(4) Velocity of body

Space for Rough Work

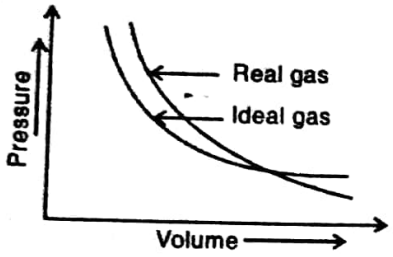
[CHEMISTRY]

46. Which of the following graph is/are correct?

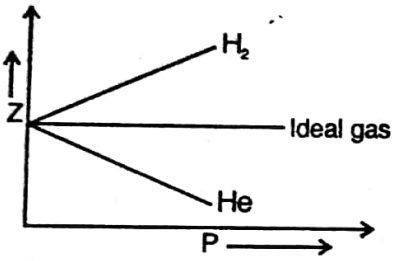
(1)



(2)



(3)



(4) Both (1) & (2)

47. How will the viscosity of liquid be affected by the increase in temperature?

(1) No effect

(2) First increases then decreases

(3) Decreases

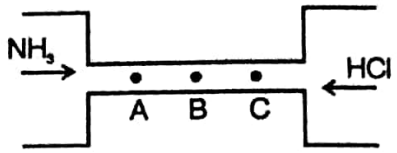
(4) Increases

48. Which of the following property of water can be used to explain the spherical shape of rain droplets?

(1) Pressure (2) Diffusion

(3) Viscosity (4) Surface tension

49. If both gases NH_3 and HCl are released at the same time then white precipitate will be formed near the point _____ shown in figure



(1) C

(2) Precipitate will not be formed

(3) A

(4) B

50. Equal volume of two gases 'A' & 'B' diffuse through a porous pot in 40 and 10 seconds respectively. If the molar mass of 'A' is 100, then calculate the molar mass of gas 'B'.

(1) 6.25 g/mol (2) 4 g/mol

(3) 10 g/mol (4) 8.5 g/mol

51. A 12 litre cylinder contains He gas at 25 atm pressure and 27°C temperature. How many balloons of 3 litre volume that can be filled from the cylinder at 1 atm pressure at 0°C?

(1) 91 (2) 75

(3) 80 (4) 87

52. Which of the following statement is/are correct?

(1) 2 moles of each H_2 and O_2 have same volume at same temperature and pressure

(2) Rate of diffusion of H_2 will be more than rate of diffusion of O_2 at the same temperature

(3) Normal boiling point of water is 100°C

(4) All of these

Space for Rough Work

53. Which is/are correct statement according to kinetic molecular theory of gases?

(1) There is no force of attraction or repulsion between gas molecules at ordinary temperature and pressure

(2) Actual volume of gas molecules is negligible in comparison to the total volume of the gas

(3) Their collisions are perfectly elastic

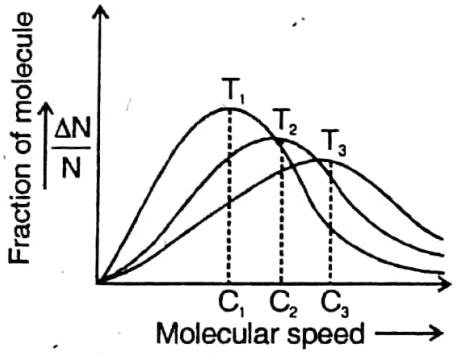
(4) All of these

54. Pair involving ion-dipole force is

(1) NO_2 & CO_2 (2) $NO_3^{\ominus}$ & HI

(3) $NO_3^{\ominus}$ & I_2 (4) $I^{\ominus}$ & I_2

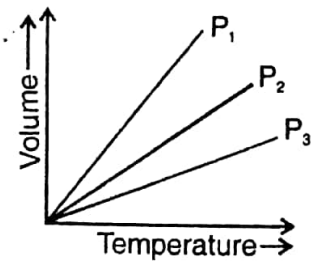
55. The order of temperature from given Maxwell Boltzman distribution curves of a gas at three different temperatures



(1) $T_1 = T_2 = T_3$ (2) $T_1 < T_3 < T_2$

(3) $T_1 > T_2 > T_3$ (4) $T_1 < T_2 < T_3$

56. In the following graph



The correct order of pressure is

(1) $P_3 > P_1 > P_2$ (2) $P_2 > P_3 > P_1$

(3) $P_1 > P_2 > P_3$ (4) $P_1 < P_2 < P_3$

57. In the ideal gas equation, the gas constant 'R' has the value of

(1) 8.314 $JK^{-1}\ mol^{-1}$

(2) 2 cal $K^{-1}\ mol^{-1}$

(3) 0.0821 atm $LK^{-1}\ mol^{-1}$

(4) All of these

58. According to kinetic theory of gases the root mean square speed is directly proportional to (T = temperature in kelvin)

(1) $\sqrt{T}$ (2) $\frac{1}{T}$

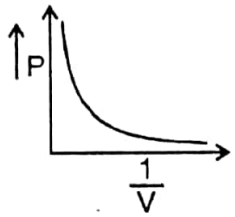
(3) T (4) T^2

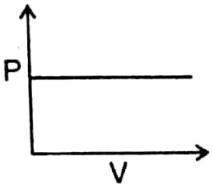
59. At moderate pressure, the compressibility factor for 1 mole of gas can be given by

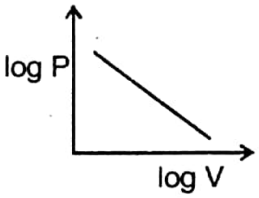
(1) $1+\left(\frac{Pb}{RT}\right)$ (2) $1-\left(\frac{a}{RTV}\right)$

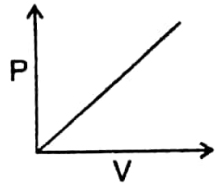
(3) $1-\left(\frac{RTV}{a}\right)$ (4) $1+\left(\frac{a}{RTV}\right)$

60. Which of the following graph represent Boyle's law?

(1)


(2)


(3)


(4)


61. Which of the following gas will have highest value of critical temperature (T_C)?

(1) NH_3 (2) C_3H_8

(3) He (4) H_2

Space for Rough Work

62. Critical temperature (T_c) of the gas is equal to

(1) $\frac{a}{27b^2}$ (2) $\frac{27a}{Rb}$

(3) $\frac{9a}{27Rb}$ (4) $\frac{8a}{27Rb}$

63. The compressibility factor (z) for an ideal gas is

(1) 1 (2) ∞

(3) 2 (4) 1.5

64. A gaseous mixture was prepared by taking equal moles of N_2 and O_2 at room temperature. If total pressure of the gaseous mixture was found to be 1 atm, then partial pressure of the nitrogen (N_2) in the gaseous mixture is

(1) 0.5 atm (2) 0.9 atm

(3) 0.6 atm (4) 1 atm

65. Which of the following statements is incorrect?

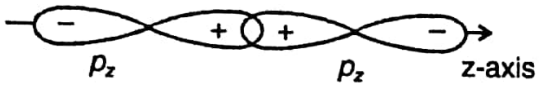
(1) π-bond allows the free-rotation between the bonded atoms

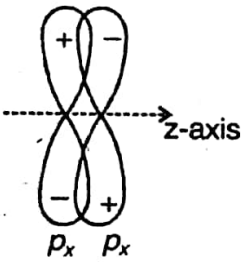
(2) π-bond is less stable than σ-bond

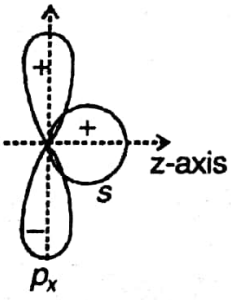
(3) π-bond does not affect the shape of the molecule

(4) Generally π-bonds are present with σ-bond

66. Which of the following is representation of positive overlap?

(1) 

(2) 

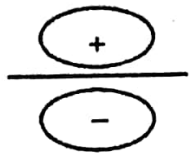
(3) 

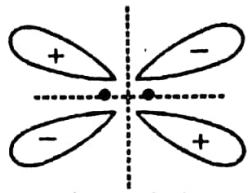
(4) All of these

67. Which of the following is correct molecular orbital representation of π*-molecular orbital?

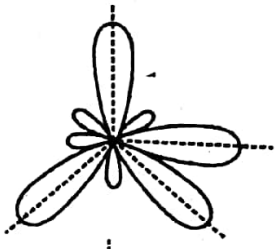
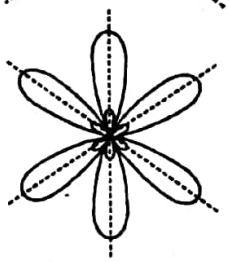
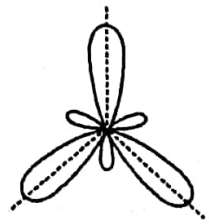
(1) 

(2) 

(3) 

(4) 

68. Which of the following is correctly matched for hybridisation?

Column-I	Column-II
(1) 	sp^3d
(2) 	sp^3d^2
(3) 	sp^2
(4) 	sp

Space for Rough Work

69. In which case intermolecular H-bonding can exist?

(1) NH_3 (2) H_2O

(3) HF (4) All of these

70. In which of the following ionisation processes the bond energy increases and the magnetic behaviour changes from paramagnetic to diamagnetic?

(1) $Be_2 \rightarrow Be_2^{\oplus}$ (2) $N_2 \rightarrow N_2^{\oplus}$

(3) $NO \rightarrow NO^{\oplus}$ (4) $C_2 \rightarrow C_2^{\oplus}$

71. Which of the following has maximum covalent character?

(1) $BeCl_2$ (2) CCl_4

(3) LiCl (4) BCl_3

72. The correct order of the (O–O) bond length in O_2, Na_2O_2 and O_3 is

(1) $O_2 > Na_2O_2 > O_3$

(2) $O_2 > O_3 > Na_2O_2$

(3) $O_3 > Na_2O_2 > O_2$

(4) $Na_2O_2 > O_3 > O_2$

73. Which of the following is/are incorrect about H-bonding?

(1) o–nitrophenol shows intramolecular H-bonding

(2) Intramolecular H-bonding is formed within same molecule

(3) Three H-bonds are formed per molecule of H_2O in solid phase

(4) All of these

74. Which of the following statement is wrong?

(1) Shape of ClF_3 is bent T-shape

(2) The hybridisation of nitrogen in nitric oxide is sp^3

(3) Shape of SF_4 molecule is see-saw

(4) Geometry of XeF_6 is pentagonal bipyramidal

75. Which of the following units is possible for the dipole moment?

(1) Centimetre (2) Metre

(3) Debye (4) All of these

76. Which of the following is written correctly about $CO_3^{2\ominus}$ ion?

(1) Formal charge on carbon in $CO_3^{2\ominus}$ is +1

(2) It has trigonal pyramidal structure

(3) It shows bond order of 1.5

(4) It shows three equally contributing resonating structures

77. Which of the following species have both σ and π bond according to molecular orbital theory?

(1) N_2 (2) B_2

(3) C_2 (4) All of these

78. Which of the following molecule is polar?

(1) PCl_3F_2 (2) XeF_4

(3) PF_3Cl_2 (4) PCl_5

79. The hybridisation of nitrogen in  is

(1) sp^3 (2) sp^3d

(3) sp (4) sp^2

80. The compound which contains ionic, covalent and co-ordinate bonds is

(1) NH_4CN (2) K_2CO_3

(3) HCN (4) KOH

81. Which of the following species is/are paramagnetic?

(1) O_2 (2) $O_2^{\oplus}$

(3) $O_2^{\ominus}$ (4) All of these

Space for Rough Work

82. The correct order of increasing bond angles in the following species is

(1) $NO_2^{\oplus} < NO_2 < NO_2^{\ominus}$

(2) $NO_2^{\oplus} < NO_2^{\ominus} < NO_2$

(3) $NO_2^{\ominus} < NO_2^{\oplus} < NO_2$

(4) $NO_2^{\ominus} < NO_2 < NO_2^{\oplus}$

83. The cylindrical shape of an acetylene is due to the fact that it has

(1) One $\sigma-$(C–C) bond and two $\pi-$(C–C) bonds

(2) Three $\pi-$(C–C) bonds

(3) Two $\sigma-$(C–C) bonds

(4) Three $\sigma-$(C–C) bonds and one $\pi-$(C–C) bond

84. Which of the following is/are correct statement(s)?

(1) With increase in bond order of molecular species, bond length decreases and bond strength increases

(2) Electrons in antibonding molecular orbital contribute to repulsion between the nuclei of two atoms of a molecule

(3) The bond energy of a diatomic molecule or species may increase or decrease when an electron is lost

(4) All of these

85. Which one of the following molecules contain no π-bond?

(1) $CO_3^{2\ominus}$

(2) $H_3O^{\oplus}$

(3) SO_2

(4) $NO_3^{\ominus}$

86. Which of the following pairs of molecular species is/are isostructural?

(1) NH_3 & $NO_3^{\ominus}$

(2) $BF_4^{\ominus}$ & $NH_4^{\oplus}$

(3) XeF_2 & $IF_2^{\ominus}$

(4) Both (2) & (3)

87. In $PO_4^{3\ominus}$ ion, number of bond pair and lone pair of electrons on phosphorus atom respectively are

(1) 3, 1 (2) 5, 0

(3) 5, 1 (4) 4, 1

88. Which of the following is/are not a correct statement?

(1) The canonical structure of a molecule or species have no real existence

(2) Multiple bonds are always shorter than corresponding single bonds

(3) Every AB_5 type molecule have square pyramidal structure

(4) All of these

89. The angle between the overlapping of one s-orbital and one *p*-orbital at the internuclear axis is

(1) 180°

(2) 109°28′

(3) 120°

(4) 120°28′

90. In an octahedral structure, the pair of *d*-orbitals involved in sp^3d^2 hybridization is

(1) d_{z^2} & d_{xz}

(2) d_{xy} & d_{zx}

(3) d_{xz} & $d_{x^2-y^2}$

(4) $d_{x^2-y^2}$ & d_{z^2}

Space for Rough Work

[BIOLOGY]

91. Choose incorrect match w.r.t. life cycles
(1) *Polysiphonia* – Haplontic
(2) *Ficus* – Diplontic
(3) *Pinus* – Diplontic
(4) *Funaria* – Haplodiplontic

92. The ploidy level of columella, rhizoid, calyptra, protonema and foot in bryophytes is respectively
(1) N, N, N, 2N, 2N (2) 2N, 2N, N, N, N
(3) 2N, N, N, N, 2N (4) N, 2N, N, 2N, N

93. The sporophyte is partial parasite over gametophyte in
(1) Irish moss and hair cap moss
(2) *Funaria* and *Marchantia*
(3) Green cord moss and peat moss
(4) Liverworts and horsetails

94. Origin and evolution of stele took place in
(1) Pteridophyte (2) Bryophytes
(3) Gymnosperm (4) Angiosperm

95. Select **incorrect** match
(1) Vascular amphibians – Gymnosperm
(2) Phanerogams with ovary – Angiosperms
(3) First tracheophytes – Pteridophytes
(4) First archegoniate – Bryophytes

96. Study the follwing features
(a) Sporic meiosis
(b) Unicellular rhizoid
(c) Dioecious nature
(d) Heteromorphic alternation of generation
(e) Haplodiplontic life cycle
(f) Green sporophyte
(g) Protonema stage

How many of the above features are related with *Marchantia*?
(1) (c), (d), (e), (g) (2) (a), (b), (d), (e), (f)
(3) (a), (b), (c), (d), (e) (4) (d), (e), (f)

97. The female gametopyte in angiosperms is/has
(1) Chalazal egg apparatus
(2) 7-celled
(3) 8-celled
(4) 7-nucleate

98. Which of the following structure is homologous to embryo sac of angiosperms?
(1) Endosperm of *Pinus*
(2) Free living sporophyte of fern
(3) Thallus of algae
(4) More than one option is correct

99. Bryophytes are not characterised by
(1) Unicellular rhizoids
(2) Meiosis in spore mother cell
(3) Reduction division in zygote
(4) Dependent sporophyte

100. The wood in *Cycas* is
(1) Homoxylous and non-porous
(2) Porous with vessels
(3) Soft wood without fibres
(4) More than one option is correct

101. The seed of gymnosperm shows _____ as representative of parent sporophyte generation.
(1) Perisperm (2) Prothallus
(3) Embryo (4) Endosperm

Space for Rough Work

102. Choose the **incorrect** option
(1) Bryophyte – Non-vascular archegoniate
(2) Gymnosperm – Naked seeds
(3) Pteridophytes – Spermatophyte
(4) Algae – Non-embryophytes

103. The prothallus of ferns is characterised by all, except
(1) Chordate and protandrous nature
(2) Parasitic over sporophyte
(3) Presence of unicellular rhizoids
(4) Monoecious condition

104. The event regarded as precursor to seed habit is
(1) Homospory
(2) Exosporic germination of spore
(3) In-situ germination of megaspore
(4) More than one option is correct

105. The aquatic fern which is used as a biofertiliser is
(1) *Adiantum*
(2) *Salvinia*
(3) *Azolla*
(4) *Dryopteris*

106. Pollination in gymnosperm is
(1) Anemophilous and direct
(2) Entomophilous and direct
(3) Anemophilous and indirect
(4) Hydrophilous and direct

107. The juvenile stage of the gametophyte in mosses
(1) Develops by germination of spore
(2) Develops from germination of spore mother cell
(3) Is formed by germination of zygote
(4) More than one option is correct

108. Male and female gametophytes do not have an independent free living existence in
(1) *Cycas* and *Cedrus*
(2) *Equisetum* and *Pteris*
(3) *Selaginella* and *Marchantia*
(4) *Pinus* and *Adiantum*

109. Asexual reproduction in liverwort takes place by
(1) Prothallus
(2) Multicellular rhizoids
(3) Gemmae
(4) Fragmentation of protonema

110. Algin and carageen are obtained from respectively
(1) *Laminaria* and *Spirogyra*
(2) *Cedrus* and *Pinus*
(3) *Ectocarpus* and *Chordrus*
(4) *Spirulina* and *Chlorella*

111. Mark the correct statement w.r.t the plant given below

(1) The root of the plant show symbiotic association with BGA
(2) It has unbranched stem
(3) It is heterosporous
(4) It has seed inside the fruit

Space for Rough Work

112. Identify the diagrams A, B, C, D

A. 

B. 

C. 

D. 

(1) A – *Fern*, B – *Marchantia*
C – *Pinus*, D – *Fern* (aquatic)

(2) A – *Riccia*, B – *Equisetum*
C – *Fern*, D – *Sphagnum*

(3) A – *Funaria*, B – *Equisetum*
C – *Selaginella*, D – *Pinus*

(4) A – *Selaginella*, B – *Equisetum*
C – *Fern*, D – *Salvinia*

113. Select **incorrect** match

(1) *Selaginella* – Heterosporous
(2) *Pinus* – Dioecious sporophyte
(3) *Marchantia* – Elater
(4) *Dryopteris* – Prothallus

114. Vascular archegoniates having haplodiplontic life cycle are

(1) Gymnosperms (2) Angiosperms
(3) Bryophytes (4) Pteridophytes

115. Mycorrhizal association is seen in roots of

(1) *Gingko* (2) *Adiantum*
(3) *Pinus* (4) *Cycas*

116. Sexual reproduction is oogamous in

(1) *Polysiphonia* and *Ectocarpus*
(2) *Ulothrix* and *Chara*
(3) *Volvox* and *Fucus*
(4) *Spirogyra* and *Ulothrix*

117. Which of the following have dioecious gametophytes?

(1) *Funaria*, *Selaginella*, *Equisetum*
(2) *Riccia*, *Marchantia*, *Adiantum*
(3) *Marchantia*, *Dryopteris*, *Adiantum*
(4) *Marchantia*, *Cycas*, *Pinus*

118. Match the columns

	Column-I	**Column-II**
a.	Spike moss	(i) *Equisetum*
b.	Horsetails	(ii) *Marsilea*
c.	Marsh fern	(iii) *Selaginella*
d.	Walking fern	(iv) *Adiantum*

(1) a(i), b(ii), c(iii), d(iv)
(2) a(iv), b(iii), c(ii), d(i)
(3) a(iii), b(i), c(ii), d(iv)
(4) a(ii), b(iii), c(iv), d(i)

119. The liverworts differ from mosses in having

(1) Fully parasitic sporophyte
(2) Gemmae cups on sporophyte
(3) Thalloid filamentous gametophyte
(4) Multicellular rhizoids

Space for Rough Work

120. The zygote forms a thick walled zygospore and undergoes reduction division in
(1) *Sphagnum* and cord moss
(2) Summer algae and maiden hair moss
(3) *Ulothrix* and *Spirogyra*
(4) *Funaria* and *Marchantia*

121. Fertilisation is siphonogamous with non-motile male gametes in
(1) *Cycas* and *Dryopteris*
(2) *Pinus* and *Calotropis*
(3) *Adiantum* and *Gnetum*
(4) *Ficus* and *Fucus*

122. *Dryopteris* and *Marchantia* are similar in having
(1) Free living thalloid gametophyte
(2) Dependent sporophyte
(3) Non-motile egg
(4) More than one option is correct

123. *Selaginella* and *Salvinia* have/are
(1) Unicellular thalloid gametophyte
(2) Terrestrial heterosporous ferns
(3) Unisexual gametophytes
(4) Produce only one types of spores

124. Each character is given equal importance and at the same time hundreds of characters can be considered in
(1) Artificial system of classification
(2) Chemotaxonomy
(3) Cladistics
(4) Phenetics

125. Vascular phanerogams having naked seeds have
(1) Pyrenoids in their chloroplast
(2) Glycogen as stored food
(3) Haploid phase which is independent and free living
(4) Reproductive leaves aggregated to form cones or strobilus

126. Kelps are massive algal forms which have
(1) Haplontic life cycle
(2) Stored food similar to glycogen and amylopectin
(3) Phycoerythrin as photosynthetic pigments
(4) Rich source of potash

127. Select **incorrect** match
(1) *Spirogyra* – Pyrenoids
(2) *Laminaria* – Starch
(3) *Chlamydomonas* – Cup-shaped chloroplast
(4) *Polysiphonia* – Haplodiplontic life cycle

128. Which of the following group of algae show maximum variation in form and size?
(1) Rhodophyceae (2) Cyanophyceae
(3) Phaeophyceae (4) Chlorophyceae

129. How many of the following algae have non-motile gametes?

Spirulina, *Chlorella*, *Spirogyra*, *Porphyra*, *Laminaria*, *Ectocarpus*

(1) Two (2) Three
(3) Four (4) One

130. The most important criteria for classification of algae is
(1) Photosynthetic pigments
(2) Reserve food material
(3) Nature of cell wall
(4) Mode of nutrition

131. The algae which is not a source of food is
(1) *Laminaria* (2) *Ectocarpus*
(3) *Porphyra* (4) *Sargassum*

132. Group of algae with sulphated phycocolloids in cell wall is also characterized by
(1) Absence of unicellular forms
(2) Floridean starch as reserved food
(3) Absence of non-motile male gametes
(4) Fresh water habitat mostly

Space for Rough Work

133. What is true for Bentham and Hooker system of classification?
(1) It placed gymnosperms before dicots
(2) The classification was based on natural affinities
(3) It was the first scientific attempt made to classify living organisms
(4) The classification was based on phylogeny

134. The branch of taxonomy which is based on protein and DNA sequence is
(1) Phenetics (2) Chemotaxonomy
(3) Karyotaxonomy (4) Cytotaxonomy

135. Green algae differ from bryophytes in
(1) Thalloid plant body
(2) Having haplontic life cycle
(3) Having motile male gametes
(4) Absence of vessels in xylem

136. Which of the following statement is incorrect w.r.t. *Pheretima*?
(1) Setae are not dissolved in potassium hydroxide
(2) Spermathecal pores are latero-ventral openings in the intersegmental grooves of 5/6, 6/7, 7/8 and 8/9 segments
(3) The skin of earthworm is brown due to presence of cytochrome pigment (porphyrin)
(4) Phaosomes (photoreceptors) are found mostly on the prostomium and first segment and in lesser number on other segments

137. Which of the following structure in the intestine of earthworm increases effective area of absorption after digestion?
(1) Armarium (2) Cuticle
(3) Villi (4) Typhlosole

138. In the rainy season earthworm excretes mainly
(1) Uric acid (2) Creatine
(3) Ammonia (4) Urea

139. Dorsal blood vessel in the body of earthworm is
(1) Distributing behind 13th segment
(2) Carrying blood from anterior to posterior end of body
(3) Main distributing blood vessel
(4) Collecting behind 13th segment

140. The process of increasing fertility of soil by earthworm is
(1) Metachrosis (2) Metagenesis
(3) Worm castings (4) Vermicomposting

141. Which of the following statement is incorrect w.r.t. reproductive system of earthworm?
(1) Protogynous condition is present
(2) Fertilisation is external with direct development
(3) There are two pairs of testes in 10th and 11th segments
(4) A pair ovaries are present on the posterior septum of 12/13 segment

142. In *Pheretima* lateral hearts are present in
(1) 10th and 11th segments
(2) 11th and 12th segments
(3) 7th and 9th segments
(4) 12th and 13th segments

143. Septal nephridia in the body of earthworm
(1) Are enteronephric type
(2) Are the smallest nephridia
(3) Are present as three paired tufts in the 4th, 5th, and 6th segments
(4) Is without nephrostome

144. Complete the following statement
Blood glands in earthworm are found in _____ segments and produce _____.
(1) 14th, 15th, 16th segments, RBC
(2) 4th, 5th, 6th segments, haemoglobin
(3) 14th, 15th, 16th segments; haemoglobin
(4) 4th, 5th, 6th segments, RBC

Space for Rough Work

145. In the circulatory system of earthworm, commissural vessels arise from
(1) Latero-oesophageal blood vessel and joins supraoesophageal blood vessel
(2) Supraoesophageal blood vessel and joins latero-oesophageal hearts
(3) Ventral blood vessel and joins dorsal vessel
(4) Sub-neural blood vessel and joins dorsal vessel

146. Calciferous glands which neutralises the humic acid in earthworm are found in
(1) Nephridia (2) Coelomic fluid
(3) Body wall (4) Gut wall

147. In earthworm at the time of mating there is a mutual transfer of sperm from ___A___ to ___B___.
(1) A – Male genital pores
B – Seminal vesicles
(2) A – Male genital pores
B – Dorsal pore
(3) A – Male genital pores
B – Female genital pore
(4) A – Male genital pores
B – Spermathecae

148. Find out the **incorrect** match w.r.t. part of alimentary canal and its location in earthworm
(1) Gizzard – 8^{th}-9^{th} segments
(2) Pretyphlosolar region – 15^{th}-26^{th} segments of intestine
(3) Pharynx – 4^{th} segment
(4) Stomach – 5^{th}-7^{th} segments

149. Protractor muscle in body of earthworm is concerned with
(1) Movement of blood
(2) Movement of food in alimentary canal
(3) Movement of prostomium
(4) Movement of setae

150. Forest of nephridia in the body of earthworm is placed in
(1) Pre-clitellar region (2) Post-clitellar region
(3) Clitellar region (4) Peristomium

151. Which of the following statement is incorrect w.r.t. malpighian tubules in cockroach?
(1) They convert nitrogenous waste products into urea, which is excreted out through hind gut
(2) Each tubule is lined by glandular and ciliated cells
(3) These are 100-150 blind yellow tubules present at the junction of midgut and hind gut
(4) They absorb urates from haemolymph along with water, salts, aminoacids etc.

152. If the head of cockroach is cut off, it will still live for as long as one week because
(1) Whole nervous system placed inside head region
(2) Whole nervous system situated in belly
(3) Brain represented by supraesophageal ganglion present in head region
(4) Rest part of nervous system at situated along with belly

153. Mark the correct statement w.r.t. cockroach
(1) The next to last nymphal stage has wing pads but only adult cockroach have wings
(2) The development of *Periplaneta americana* is hemimetabolous
(3) On an average, females produces 14-16 oothecae and each containing 9-10 eggs
(4) The nymph grows by moulting about 10 times to reach the adult form

154. Superposition image would be formed in cockroach if
(1) Pigment sheaths become non-contractile
(2) Pigment sheaths become contractile
(3) Pigment sheaths are removed
(4) More than one option is correct

Space for Rough Work

155. Moulting hormone called ecdysone in cockroach is secreted by
(1) Prothoracic glands
(2) Intercerebral gland cells
(3) Corpora allata
(4) Corpora cardiaca

156. If frog kept inside iodine deficient pond water, metamorphosis of tadpole larva
(1) Is not affected and continues normally
(2) Is suspended for some time but later begins normally
(3) Becomes faster
(4) Fail to begin

157. Which of the following part of stomach is absent in frog?
(1) Pyloric (2) Jejunum
(3) Cardiac (4) Fundus

158. In frog, the hollow cranial skeleton opens by a large median aperture through which medulla continues as spinal cord. This aperture is called
(1) Columella auris (2) Foramen of monro
(3) Fenestra ovalis (4) Foramen of magnum

159. Frog differs from toad in
(1) Bearing toothless jaws
(2) Having bifid tongue at free end
(3) Being nocturnal
(4) Skin rough and dry

160. Which of the following is **incorrect** statement w.r.t. skin of frog?
(1) On the ventral side of body skin is generally olive green with dark irregular spots
(2) Skin helps the frog in slipping out of the grip of an enemy
(3) Skin is always kept moist and slimy by mucus secreted by cutaneous glands
(4) Skin serves as an important accessory respiratory organ

161. Stomodeal valve in the alimentary canal of cockroach is present at the junction of
(1) Gizzard and mesenteron
(2) Oesophagus and crop
(3) Gizzard and crop
(4) Mesenteron and proctodaeum

162. Mark the correct corresponding number w.r.t. cockroach and frog.
(1) Number of ommatidia in each compound eye of cockroach – Number of vasa efferentia in male frog
(2) Number of spiracles in cockroach – Number of chambers in heart of cockroach
(3) Number of spiracles in cockroach – Number of cranial nerves in frog
(4) Number of salivary muscles in cockroach – Number of spinal nerves in frog

163. Peritrophic membrane which serves to protect the wall of midgut from abrasion due to friction of rough surface of food particles is formed by
(1) Hepatic caeca
(2) Malpighian tubules
(3) Crop
(4) Gizzard

164. Which of the following part in the leg of cockroach helps it to move on smooth surfaces like ceiling and vertical wall?
(1) Claw (2) Plantulae
(3) Femur (4) Tibia

165. A pair of anal styles in male cockroach are
(1) Jointed structures arising from 9th sterna
(2) Unjointed structures arising from 10th terga
(3) Jointed structures arising from 10th terga
(4) Unjointed structures arising from 9th sterna

Space for Rough Work

166. Find out the incorrect statements w.r.t. head of cockroach
(1) Head is formed by the fusion of six embryonic segments
(2) Chewing and lapping type of mouth parts are found in head
(3) Tentorium is the endoskeletal structure of the head
(4) Head is triangular and present at an angle of 90º from the long axis of the body

167. Consider the following figure of reproductive system of female cockroach with certain labellings A, B, C and D. Find out the **correct** labelled structure and its function/description

(1) C – Collateral glands – Storage of ootheca
(2) D – Genital chamber – Fertilisation takes place
(3) A – Ovary – Release eight fertilised eggs
(4) B – Common oviduct – Stores spermatophores of male cockroach

168. Spermatophore of male cockroach has three layered wall. The inner, middle and outer layer is respectively secreted by
(1) Ejaculatory duct, utriculi majores, phallic gland
(2) Phallic gland, utriculi majores, ejaculatory duct
(3) Phallic gland, ejaculatory duct, utriculi majores
(4) Utriculi majores, ejaculatory duct, phallic gland

169. Which of the following is an **incorrect** match w.r.t structure and its location in male and female cockroach?
(1) Testes – 4^{th} - 6^{th} abdominal segments
(2) Ovaries – 2^{nd} - 6^{th} abdominal segments
(3) Spermathecae – 8^{th} abdominal segments
(4) Mushroom gland – 6^{th} - 7^{th} abdominal segments

170. *Blatta orientalis* differs from *Periplaneta americana* in
(a) Colour
(b) Size
(c) Length of wings
(d) Number of moultings in life
(1) (b), (c) & (d) (2) (a), (b), (c) & (d)
(3) (a), (b) & (c) (4) (a), (c) & (d)

171. Which of the following statement is correct w.r.t frog?
(1) Frog is myopic on land and hypermetropic in water
(2) Ear in frog serve as balancing organ only
(3) In female frog ureter carries both ova and urine
(4) Corpus callosum is a sheet of nerve fibers which connect the left and right cerebral hemispheres

172. All of the following is exhibited by frog, **except**
(1) Sexual dimorphism (2) External fertilization
(3) Camouflage (4) Echolocation

173. Which of the following is an unpaired structure in *Rana tigrina*?
(1) Diencephalon in forebrain
(2) Kidneys
(3) Optic lobes in midbrain
(4) Lungs

174. Select the correct sequence of movement of sperms in male frog
(1) Testes → Vasa efferentia → Urinogenital duct → Bidder's canal → Cloaca
(2) Testes → Urinogenital duct → Bidder's canal → Vasa efferentia → Cloaca
(3) Testes → Vasa efferentia → Bidder's canal → Urinogenital duct → Cloaca
(4) Testes → Bidder's canal → Vasa efferentia → Urinogenital duct → Cloaca

Space for Rough Work

175. Consider the following statements with certain blanks and choose the option which correctly fills up these blanks

(A) A triangular structure called sinus venosus is present on ___(i)___ side of heart.

(B) The alimentary canal in adult frog is ___(ii)___ because they are ___(iii)___ .

(C) Frog absorbs water through the___(iv)___.

(1) A (i) Dorsal
B (ii) Short, (iii) Carnivores
C (iv) Skin

(2) A (i) Ventral
B (ii) Short, (iii) Carnivores
C (iv) Cloaca

(3) A (i) Ventral
B (ii) Short, (iii) Carnivores
C (iv) Skin

(4) A (i) Dorsal
B (ii) Long, (iii) Herbivores
C (iv) Skin

176. Which of the following structures are absent in frog?

(a) Diaphragm
(b) Ribs
(c) Loop of Henle in nephron
(d) Cochlea in internal ear

(1) (a), (c) & (d)
(2) (a), (b), (c) & (d)
(3) (a), (b) & (c)
(4) (b), (c) & (d)

177. During aestivation and hibernation gaseous exchange in frog takes place through

(1) Skin
(2) Buccopharyngeal cavity
(3) Lungs
(4) All of these

178. Which of the following statement is incorrect w.r.t. digestive system in frog?

(1) Tongue is bilobed at the tip and free from posterior end
(2) Liver does not secrete any digestive enzyme
(3) Dentition in frog is homodont, acrodont and polyphyodont
(4) Digestion begins in buccal cavity

179. Amplexusary or nuptial pad is formed on

(1) Dorsal s of first finger (inner) of each forelimb in female og during breeding season
(2) Ventral side of first finger (inner) of each forelimb in female frog during breeding season
(3) Dorsal side of first finger (inner) of each forelimb in male frog during breeding season
(4) Ventral side of first finger (inner) of each forelimb in male frog during breeding season

180. Which of the following statement is incorrect w.r.t limbs of frog?

(1) The digital formula of forelimbs is 02233 and that of hindlimb is 22343
(2) The forelimbs and hindlimbs have webbed digits that help in swimming
(3) The forelimbs end in four digits
(4) The hindlimbs are larger and muscular than forelimbs

❑ ❑ ❑

Space for Rough Work